

REPORT

OF

PROFESSOR E. J. CHAPMAN,

ON MINERAL LOCATIONS IN NORTH HASTINGS,

ONTARIO.

In accordance with instructions, I have visited and carefully examined the mineral properties in North Hastings, Ontario, belonging to Mr. Coe, the well-known mining expert of Madoc; and I have made a thorough analysis of samples taken personally from each separate property. The samples in every instance faithfully represent the average quality of the ore deposits from which they were taken; but the greater number, it should be observed, are necessarily surface samples.

These mining properties lie in the townships of Tudor, Wollaston, Lake, Limerick and Marmora, and comprise altogether a thickly timbered area of about 15,000 acres. The greater portion of this extensive area forms part of (or lies immediately adjacent to) the elevated tract of country known as the "Iron Range." This extends in a general east and west direction over a length of many miles, although cut in places by transverse valleys and ravines; and it presents an average width of from six to eight miles. Iron ore—the finest quality—abounds within this range, and outcrops at many spots in enormous masses. The entire range is very heavily timbered with both pine and hardwood; and as the locations more especially referred to in this Report lie towards the two extremities of the range, several intervening miles of country (included within the limits of the property) still remain unexplored, and undoubtedly contain additional bands of ore.

In order to carry on the mining of these ore deposits successfully a railway of about thirty miles in length would be required for the conveyance of ore to the front; but a line of twenty miles, practically free from engineering difficulties, would connect some of the largest and finest deposits with the line of rails which now extends to Eldorado, seven or eight miles north of the thriving village of Madoc; and the valuable hematite location in Marmora township (see below) is within ten or eleven miles of this village. At Madoc, the Belleville and North Hastings Railway connects with the Grand Trunk at the town of Belleville, a shipping port on Lake Ontario.

The mining locations (within the Coe property) which form, more especially, the subject of the present Report, comprise: the "Emily Iron Mine," the "Horse-shoe or Baker Iron Mine," and the "Louise Iron Mine," of the township of Tudor; the "Batchelor Iron Mine," of the township of Wollaston; the "Bentliff Iron Mine," of Marmora township; and the "Wadsworth Lead Mine," of the township of Limerick. Brief descriptions of these with an analysis of the ore obtained from each location, are appended.

TOWNSHIP OF TUDOR.

1. THE EMILY MINE.

The location thus named is held in fee simple. It comprises Lots 6, 7 and 8, of the 19th concession of Tudor—an area of 338 acres, situated immediately upon the Iron Range. The country-rock consists essentially of green hornblende and pyroxenic strata, belonging to the higher portion of the Laurentian series.* The entire location is thickly timbered. At the actual site of the Emily Mine the ground rises more or less abruptly to a height of about 180 feet, and, along the face of this slope, ledges of magnetic ore crop out, or are revealed by trenches, from the base of the slope to within a short distance of the summit, where the ore is capped over by an inconsiderable layer of rock. The length of the slope is at least 11,000 feet, and its breadth exceeds 10 feet, but the ore can be traced much beyond these limits. Although the property has been developed sufficiently to prove the presence of a vast amount of ore (of uniformly good quality throughout its whole extent), it is not possible, in the present condition of the ground, to define absolutely the actual nature of the deposit. It is probably an enormous mass of "stock," and it must undoubtedly extend downwards to a very considerable depth, whilst in the exposed portion above ground an amount of many thousands of tons is evidently included. In the absence of shafts and tunnels precise figures cannot of course be given; but that the ore at this spot is present in great quantity is beyond question. As regards quality, the ore admits of the very highest praise. It is a soft, black, strongly magnetic ore, of a fine-granular and porous texture, and is thus easily mined and smelted. My analysis (made upon an average surface specimen) shows, moreover, that it is rich in metal, perfectly free from titanium, and practically free from sulphur and phosphorus. The analysis is as follows:

Ferrous Oxide.....	28.32
Ferrie Oxide.....	63.24
Chromite.....	trace
Titanic Acid.....	none
Phosphorus.....	0.02
Sulphur.....	8.36
Siliceous Rock-matter.....	99.94

Metallic Iron=96.37 per cent.

NOTE.—The intermixed rock-matter is essentially pyroxene with slight excess of silica, and would be therefore nearly self-fluxing. It consists of Silica, 5.22; Lime, 1.93; Magnesia, etc. (by difference), 1.21=8.36.

2. THE HORSE-SHOE OR BAKER MINE.

This property consists of Lot 18, in the 18th concession of Tudor, and comprises 100 acres, held by "mineral rights"—a condition which involves right of roadway, power of cutting timber for mining use, and all other mining privileges. The country rock of the location is the same as that of the Emily Mining Location described above, the two properties lying on the same Iron Range, about four miles apart. The actual site of the Horse-shoe Mine presents the form of a long broken curve, or semi-circle, somewhat abruptly facing the east, and extending north and south over a length of more than 1,200 feet. The ground slopes upwards towards the west; and about half way up the slope, a ledge of ore can be traced along the entire face of the curve. Eight pits or trenches, from five or six feet to about fifteen feet in depth, and extending into the slope westward from twenty to thirty-five feet, have been opened at short distances along the ledge. All show good and continuous ore, with solid floors of ore in each trench. A drift or tunnel carried in from the foot of the slope, westwards, would reveal, it is evident, a very large body of ore in this mine; but in its present state of development, precise figures, as to quantity, cannot fairly be attempted. The owner's intention seems to have been to develop the location sufficiently to show that it contains undeniably a vast supply of ore; and this he has done, without incurring useless expense in further development. Beyond the limits stated above, the tipping-needle shows very strong attractions; and at a distance of about 500 feet south of the present exposure, a large mass of similar ore comes to the surface. All the indications, indeed, point to a very large amount of ore upon the ground.

The ore itself is a magnetic ore of very superior quality, as shown by my analysis. Here and there it may contain a thin string of pyrites, but that is of exceptional occurrence, and does not affect the general quality of the ore. In the samples which I examined, the amount of metal exceeds 68 per cent. and the rock-matter is under 6 per cent. Titanium is altogether absent; phosphorus is present in traces only (two examinations showed less than 0.01); and the sulphur in the average ore is practically of no moment. The intermixed rock-matter contains silica, alumina, lime, magnesia, and iron oxides, and would be self fluxing or nearly so. The analysis showed:

Ferrous Oxide.....	29.18
Ferrie Oxide.....	54.85
Titanic Acid.....	none
Phosphorus.....	trace
Sulphur.....	0.13
Siliceous Rock-matter.....	5.86
	99.92

Metallic Iron=68.18 per cent.

3. THE LOUISE MINE.

This property comprises Lots 55, 56 and 57 of the Free Grant District, township of Tudor. It is very densely timbered throughout its whole extent, and is held in fee simple. The main outcrops of ore occur upon a thickly wooded slope, and indicate without question a very large supply, apparently forming an imbedded mass or "stock," the principal axis of which extends in a general east and west direction, and is traceable throughout a length of at least 1,400 feet. Seven or eight trenches have been opened across the face of the slope, in very solid ore, from the base to within a short distance of the summit, in lengths of from 60 to about 160 feet, but outlying exposures show the mass of ore to extend much beyond these limits. The ore is strongly magnetic, and holds over 60 per cent. metallic iron, but unfortunately contains titanium. The amount of the latter is said to be quite low in samples obtained from some of the exposures; but in the sample analyzed by the writer, 8.08 titanic acid was obtained, equivalent to five per cent. titanium. The complete analysis yielded:

Ferrous Oxide.....	25.85
Ferrie Oxide.....	57.61
Titanic Acid, &c.—Titanic Sesquioxide.....	7.30
Phosphorus.....	0.01
Sulphur.....	0.06
Siliceous Rock-matter.....	0.31
	100.04

Metallic Iron=60.36 per cent.

*As originally defined by Sir William Logan, but a proposition has recently been made to refer these strata to the Huronian series. The question, however, is of no practical interest.

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TOWNSHIP OF WOLLASTON.

4. THE BATCHELOR MINE.

This location comprises Lots 15 and 16, in the 8th concession of Wollaston. It consists of 200 acres of cleared and cultivated land, Mr. Coe possessing all its mineral rights. The surface slopes upwards from comparatively low ground upon the east to an elevation of about 80 feet, when it forms a generally level or slightly undulating area. Along the brow of the slope facing the east a number of openings have revealed a continuous outcrop of magnetic ore, ranging in a general north and south direction over a length of about 500 yards, whilst strong needle-attractions point conclusively to its continuation much beyond that distance. Trenches are now being carried at right angles to this line of outcrop towards the west, in which direction the needle assumes a vertical position over distances of from 80 to 105 feet from the eastern outcrop, with good indications of ore still further west. So large a mass must evidently extend downwards to a considerable depth. Taking eight cubic feet of the ore, in place, to equal a ton (and seven feet would be nearer the mark), each ten feet in depth, within the limits stated above, should yield at least one hundred and fifty thousand tons. If a tunnel were driven into the eastern face of the slope, a very large body of ore, I am confident, would be rapidly struck.

As regards quality, the ore of this location leaves nothing to be desired. The sample analysed yielded 66 per cent. metallic iron, but the sample was slightly peroxidized, so that perfectly unweathered specimens would probably run nearly one per cent. higher. The ore is quite free from titanium, and very low in phosphorus and sulphur. The analysis showed:

Ferrous Oxide	20.12
Ferric Oxide	65.20
Titanium	none.
Phosphorus	0.02
Sulphur	0.07
Siliceous Rock-matter	8.48
	99.99

Metallic Iron = 66 per cent.

The rock-matter was not analysed quantitatively, but it is essentially pyroxenic, and would therefore be practically self-fluxing.

TOWNSHIP OF MARMORA.

5. THE BENTLIF MINE.

This property—held in fee simple—forms the west half of Lot 13 in the 10th concession of Marmora. It comprises 100 acres, partly cleared, but consisting in chief part of richly timbered land, lying about six miles from the present terminus of the North Hastings Railroad, and two miles from a projected line of railway. Its distance from Mable (by good road) is about eleven miles, and from Marmora, six miles. With the exception of five or six trial pits at

considerable distances apart, this property remains undeveloped; but as all the pits show ore, there is evidently a considerable amount upon the lot, although this is more or less thickly capped by quartzite in most places. But the ore itself is of so remarkably fine a quality, that any expenditure in opening up the ground would be warranted. It consists of an almost chemically pure hematite or specular iron ore, holding, according to my analysis, 69.35 per cent. metallic iron, with less than one per cent. of intermixed rock-matter, more traces of sulphur and phosphorus, and no trace of titanium. It presents a steel-grey color and dark red streak, and its structure under the microscope is seen to be finely porous. The ore is thus more or less permeable to gases, and would work kindly in the furnace. My analysis yielded:

Ferric Oxide	90.07
Manganese Oxide	trace
Titanium	none
Phosphorus	trace
Sulphur	trace
Siliceous Rock-matter	0.89
	99.96

Metallic Iron = 69.35 per cent.

NOTE.—Only two hematite mines—one of which was opened by Mr. Coe, and subsequently sold by him to a Pennsylvania Company—are being worked in this section of country. Large quantities of ore are raised daily from both mines, and are shipped from Belleville to furnaces in the States.

TOWNSHIP OF LIMERICK.

THE WILDSWORTH LAKE MINE.

This is a lead mine on which a considerable amount of work has been done, but which is now closed, chiefly, it is said, in consequence of the low price of lead. The property comprises Lot 1 in the 2nd concession, and Lots 2, 3 and 4 in the 3rd concession of Limerick. The lead ore—galena—runs in two veins, which are nearly parallel to the surface, but which come together underground. A shaft has been sunk on each vein, one to a depth of about 142 feet, and the other to a depth of 133 feet, and a good deal of drifting has been done. The veins, at this depth, are said to be from five to eight feet wide, and they can be traced over a surface distance of at least three miles. The country-rock is grey gneiss, and the vein-stone consists essentially of calcite. At the time of my visit, however, both shafts were full of water, and I had therefore no opportunity to examine the mine. I do not therefore profess to report upon it, but merely indicate its occurrence on Mr. Coe's property. From one of the dumps I took some samples of galena, and these I have assayed for silver. The reduced lead is soft and very malleable, but the galena does not contain (so far as regards my samples) more than 3 oz. (strictly, 4 oz. 18 dwts. 12 grs.) per ton of 2,240 lbs.

RECAPITULATION AND GENERAL SUMMARY.

(1.) The property which forms the subject of this Report lies in the townships of Marmora, Lake, Tudor, Wollaston and Limerick, in North Hastings, Ontario, and comprises an area of about 15,000 acres.

(2.) The greater portion (averaging acres) is held in fee simple.

(3.) Almost the entire area is very heavily timbered, chiefly with pine, elm, beech and maple.

(4.) A large part of the district, lying between the proved mining grounds, is still unexplored, and may be legitimately assumed to hold workable deposits of ore.

(5.) Omitting the lead mine of the township of Limerick, which as explained above, I was unable to examine sufficiently, and omitting also the large titaniferous deposit known as the Louise Mine in Tudor, the property holds four known iron deposits of apparently inexhaustible dimensions and great richness and purity. These form the Emily, the Horse-shoe or Baker, and the Batchelor, magnetic ore deposits, showing respectively the following percentages of iron: 66.30, 64.10, and 66; and the marvellously pure hematite of the Benthif deposit, holding 69.35 per cent. metal.

(6.) These deposits, from the configuration of the ground, present in every case great facilities for being cheaply and readily mined. Almost any force of men might be put upon them from the commencement.

(7.) The ore from the Benthif Mine might be teamed (if this be thought desirable) to the front, for shipment, especially during winter; but the other mines could not be successfully worked without railway accommodation. The total length of railway required would be about 30 miles; and a mineral railway of this length might be laid down from the general nature of the country, at comparatively little cost. There would be no right of way to purchase, and no engineering difficulties, properly so-called, to overcome.

(8.) Although it may be found most expedient, at the outset, to mine and ship the ore for furnace treatment elsewhere, the manufacture of charcoal pig upon the ground might be carried on with good profit. Whilst the pig from ores of this quality would command in Canada a ready sale and comparatively high price, the cost of making ought not to exceed \$19 or \$20 per ton, as shown by the subjoined estimate:

Mining, hauling and breaking 11 tons of ore	\$3 00
Charcoal, 24 cwt. at 4 cents the bushel of 18 lbs.	12 00
Limestone, &c.	6 15
Furnace expenses	4 50
	\$19 65

In conclusion, I beg to say that I have no pecuniary interest in this property, nor in any other mineral property in Canada.

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